CONSERVATIVE COALITION *for* CLIMATE SOLUTIONS

Congress Must Capitalize on Nuclear Power Momentum

After the ADVANCE Act, What's Next for Nuclear Energy Policy?

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KEY TAKEAWAYS:

1. **The ADVANCE Act includes several provisions to improve the market outlook of America's civilian nuclear industry, but additional, bolder reforms are necessary for nuclear power to flourish.**
2. **Federal agencies should streamline environmental reviews and reduce redundancies in the licensing process for nuclear energy projects.**
3. **Congress should modernize radiation standards, develop a comprehensive spent fuel management program that empowers the private sector, and increase international collaboration to enhance American competitiveness.**

INTRODUCTION

President Joe Biden recently signed the Accelerating Deployment of Versatile, Advanced Nuclear for Clean Energy (ADVANCE) Act into law.[1] Passed with broad bipartisan support (88-2 in the Senate, 393-13 in the House), the ADVANCE Act includes provisions to modernize regulations, increase international collaboration, and reduce costs for investment and deployment.[2]

Along with the 2019 Nuclear Energy Innovation and Modernization Act, this marks two significant pieces of nuclear legislation signed into law in the past five years, one by President Trump and one by President Biden. Policymakers on both sides of the aisle are clearly hungry to improve the market outlook for nuclear power. However, Congress cannot rest on its laurels. Both bills are important stepping stones in the right direction, but bolder reform is needed to accelerate the deployment of nuclear power. By building on the success of the ADVANCE Act and addressing major outstanding regulatory barriers, Congress can better embolden the nuclear industry to deliver clean, affordable, and reliable power to consumers.

REDUCING GOVERNMENT-IMPOSED COSTS

Section 204 of the ADVANCE Act removes from the NRC fee base costs associated with pre-application activities and early site permits at Department of Energy sites or other critical national security infrastructure.[3] For many first-of-a-kind nuclear

technologies, demonstration projects at DOE facilities are critical to testing new concepts, recognizing design inefficiencies, and attracting investors. For instance, advanced nuclear company Oklo is currently working with Idaho National Laboratory to create and test its novel Aurora microreactor design. Eliminating NRC-affiliated fees for these activities would reduce the cost of entry for many innovative designs. In fact, Congress could go one step further by shifting all application licensing fees and safety costs to the federal government. The provisions of nuclear safety are a public good and thus the costs should be borne by the taxpayer. If some fee costs help prevent frivolous applications (which the NRC may be able to vet quickly anyway), other fee exemptions could help reduce the costs while establishing a barrier to entry for unserious applicants.

Section 401 includes another crucial component of ADVANCE. This section directs the NRC to conduct a report on material standards in the industry. Specifically, the report will examine opportunities to use standard "materials, parts, or components in manufacturing and construction for nuclear energy projects."[4]

The steel, rebar, and concrete used to build nuclear power plants must adhere to strict quality assurance standards to ensure that the materials are "nuclear grade." The cost of these materials can be as much as 50 times higher than their conventional counterparts. That's not because they are stronger or better (they are often the same material), but because they must undergo a litany of paperwork, documentation, and red tape.[5]

As Brian Potter of the Institute for Progress aptly put it, "Documentation requirements also increase costs indirectly, by reducing market competition among manufacturers. Because these requirements are difficult for manufacturers to implement, many simply don't bother to manufacture nuclear-grade components."[6]

The federal government inflates the cost of nuclear power in other ways that yield little to no environmental benefit. Two of the biggest issues that policymakers must address are radiation standards and spent fuel management. To that end, Congress should:

- **Modernize radiation standards**

  Under the current regulatory structure, nuclear power plants must produce radiation levels that are as low as reasonably achievable (ALARA). ALARA is based on the Linear No-Threshold (LNT) model, which implies proportionality between dose and cancer risk, a relationship that is not supported by scientific data and experiments.[7] In other words, the model assumes that because a chemical is dangerous at a high level, it is also dangerous at any low level. As Adam Stein, the Director of Nuclear Energy Innovation at The Breakthrough Institute, has pointed out, under the LNT there is "no dose of radiation that is completely safe."[8] Despite its scientific inaccuracies, federal agencies rely on the LNT model and ALARA for many regulations to impose excessively stringent regulations.

  ALARA standards impose a moving target that is difficult and expensive to attain because plant operators and reactor developers can always emit less radiation. As a result, ALARA drives up compliance and staffing requirements, which adds unnecessary costs to power plant operations and makes nuclear energy less competitive in energy markets. And these higher costs provide negligible public health and safety benefits. Not only is ALARA out of step with science, but it is also incredibly expensive and ignores tradeoffs. While other life-saving measures, such as vaccines and seatbelts, are estimated to cost $10 for every life they save, civilian nuclear radiation standards are estimated to cost anywhere from $1 million to several billion dollars per life saved.[9]

  Because nuclear power plants emit low levels of radiation and are inherently safe, ALARA standards provide marginal public health benefits and are therefore incredibly inefficient. And, when factoring in how ALARA and other standards have increased costs for nuclear power construction, preventing more power plants from getting built, the cost of ALARA only increases.

  ALARA also shields competition by increasing barriers for innovative technologies. Jack Devanney, the founder of advanced nuclear company ThorCon, points out that ALARA standards for tritium—an isotope that emits low levels of radioactivity and would have to be directly ingested at a high rate to be a health hazard—increase operational costs for molten salt reactors (MSR). While these reactors can be designed more efficiently than pressurized water reactors (PWRs), MSRs emit 60 times more tritium than PWRs. This forces MSR designers to "employ an expensive extra loop cutting their economic advantage over the PWR and creating another set of fault points."[10]

ALARA also contributes to the larger issue of social acceptance of nuclear power that the nuclear industry and proponents of nuclear power must navigate. Because no amount of radiation is safe under ALARA or the LNT model, the public is often led to believe that nuclear power is inherently dangerous. The fact is that it is one of the safest energy sources available.[11] This fear has led to power plant shutdowns, public backlash, and a risk-averse regulatory structure and has put nuclear power at a disadvantage compared to other energy sources. Low-level radiation from a coal plant, for instance, can easily be higher than radiation from a nuclear power plant. But coal's radiation is completely unregulated.[12]

Putting radiation standards closer to those that nuclear power plant workers have, 50 millisieverts per year, would not only be better aligned with science, but it would also make nuclear more competitive and lower the cost of bringing baseload, pollution-free power online.

- **Develop a comprehensive spent fuel storage management plan**

The absence of a comprehensive spent fuel management plan has crippled the industry's ability to develop innovative solutions to spent fuel management, hurt public support for nuclear power, and led several state legislatures to ban nuclear energy within their borders. Per the Nuclear Waste Policy Act of 1982, as amended, the federal government was supposed to manage spent fuel and develop long-term repositories, but it has failed to fulfill its statutory obligation. Consequently, the federal government pays power plant operators to store spent fuel on-site. Taxpayers are spending $2 million per day. That's nearly $9 billion total since 1998. If left unaddressed, this figure will rise to an estimated $30 billion by 2030.[13]

While a geologic repository like Yucca Mountain in Nevada may be ideal, the state's opposition (though Yucca has support from many residents and officials in Nye County, NV where it would deliver economic benefits) to the project may make it untenable.[14] The federal government should consider ways to gain more community support for proposed repositories. Finland and Sweden, for instance, regularly engaged with local stakeholders, communicated about the economic benefits and minimal risks, and convened workshops before selecting the site of their permanent storage facilities.

While the ADVANCE Act directs the Department of Energy to conduct a biannual report on the current state of spent fuel management in the United States and offer solutions to address it, the onus is on Congress to take legislative action. Many of the suggestions from the 2012 Blue Ribbon Commission on America's Nuclear Future, which include establishing a new federal waste management agency and establishing intermediate and permanent depositories, still ring true today.[15] Policymakers should also explore the impediments to spent fuel recycling in the U.S.

More fundamentally, however, Congress needs to find ways to introduce private sector management and price signals into spent fuel operations and disposal. While the federal government may be the entity that takes long-term ownership of spent fuel (as it is the entity that can take the longest-term view), the industry has proven very capable of efficiently and safely operating power plants. International models, like Finland, empower the industry to manage and pay for long-term nuclear waste storage.[16] The same should be done in the U.S.

LICENSING AND PERMITTING

A central goal of the ADVANCE Act is to bring nuclear regulations into the 21st century. One way the bill does this is by updating the Nuclear Regulatory Commission's Mission Statement to consider the benefits of civilian nuclear power. Until the bill's passage the NRC mission statement only emphasized protecting public health and safety, national security, and the environment.[17] This simple, yet important change which is aligned with the language in the Atomic Energy Act (AEA) of 1954 and Energy Reorganization Act of 1974, will help the NRC consider and communicate the economic and environmental benefits of nuclear power to society. It can also serve as a subtle but important cultural signal that the Agency needs to be an enabler, not a barrier.

Section 506 of the bill directs the NRC to issue a report to Congress on more efficient environmental reviews under the National Environmental Policy Act (NEPA).[18] Ways of doing so include using more categorical exclusions (CEs) and generic environmental impact statements for nuclear applications, authorizing the use of an applicant's environmental impact statement as the Commission's draft environmental impact statement, and using online and digital technologies to allow applicants to upload documents, coordinate with the NRC and edit these documents in real-time. NEPA is an impediment to all energy projects, but particularly clean energy projects including nuclear.[19] Streamlining the process while maintaining flexibility for the NRC to tailor its analysis to specific circumstances would help minimize delays without compromising public health and safety.

Section 207 speeds up the Combined License (COL) review process in certain circumstances.[20] A COL allows an applicant to both construct and operate a nuclear power plant. The bill will expedite the COL procedure for reactor designs that have been certified by the NRC, sites that have had a power plant operating or are currently in operation, or a design that is "substantially similar" to a design of a nuclear reactor for which the NRC has offered a COL.

Under this section, the NRC must, to "the maximum extent possible," complete the technical review and safety evaluation and the final Environmental Impact Statement (EIS) or Environmental Assessment (EA) within 18 months after the design is accepted for docketing. Within two years, the NRC must complete any necessary public hearings, and within 25 months, the agency must issue a final decision on the COL application. It will be critical that the Agency strives to not only meet these targets but to eventually exceed them.

To further improve the licensing and permitting process, Congress should:

- **Consider multiple avenues, including expanded use of categorical exclusions, to streamline environmental reviews (including reactor demonstration projects)**

  Under NEPA, federal agencies can grant CEs for projects that are determined to have no significant impact on the environment. With relatively small land footprints and nearly zero greenhouse gas emissions during production, nuclear power plants certainly fit the criteria to qualify for categorical exclusions. Understanding the needlessness of comprehensive environmental reviews, it is worth noting that the Obama administration issued 179,000 categorical exclusions to stimulus projects to get the money out the door as quickly as possible.[21] Further, absent an EIS or EA under NEPA, nuclear power plants would still have to meet rigorous environmental and public safety standards under the Clean Air Act, Clean Water Act, Coastal Zone Management Act, and other federal and state statutes, including other regulations and certifications by the NRC.

  Encouragingly, the NRC is currently considering expanding its categorical exclusion criteria to include new amended, revised, or renewed certificates of compliance for cask designs for spent nuclear fuel, decommissioning management funds, and changes to requirements for fire protection, cybersecurity, and emergency planning. The agency is also consolidating its approved CEs to reduce certain clerical and administrative redundancies.[22]

  Greater use of CEs, including for the Advanced Reactor Demonstration Program, will improve the review process without compromising environmental protection. Specifically, the federal agencies should grant CEs for all projects whose environmental impacts are well-documented and understood, brownfield sites, and fuel fabrication facilities.[23] In its draft EIS for activities in support of commercial HALEU production, the Department of Energy found that activities conducted on the site of existing uranium fuel cycle facilities will have a small impact on the environment.[24]

  Generic Environmental Impact Statements (GEIS) are another more efficient licensing that the NRC uses but should be implemented more frequently when a full Environmental Impact Statement is required. GEISs provide a streamlined process for the agency to consider the environmental impacts of a project based on a list of broad, site-neutral criteria which are labeled as Category 1. Criteria that vary from site to site are labeled Category 2 and are considered on a case-by-case basis. The NRC currently utilizes GEISs for license renewal applications, but the agency is developing a process for new reactors. This system empowers the NRC to quickly address issues that have no environmental impact with the flexibility to meet the issues for different reactor designs.

In April, the NRC staff released its draft GEIS rule for new builds of advanced reactors only.[25] However, agency Commissioners authorized staff to publish the draft ruling for public comment in the Federal Register, contingent they "change the limited applicability of [the] GEIS from solely 'advanced nuclear reactors' to any new nuclear reactor application.[26] The Commissioners' insistence on adopting a technology-neutral GEIS approach is encouraging and should provide a blueprint for future licensing processes that are flexible and risk-informed.

The draft ruling identifies 121 environmental issues (102 Category 1 and 19 Category 2).[27] In other words, the overwhelming majority (84 percent) of the issues have minimal environmental impact that the NRC can address with generic guidance. According to the NRC staff report, these efficiency gains can reduce the costs of environmental reviews from 20 to 45 percent.[28]

In addition to the expanded use of GEISs, the NRC should also expand the use of quicker Environmental Assessments and Findings of No Significant Impact (FONSIs) to the greatest extent possible. The Fiscal Responsibility Act directs federal agencies to use an EA for projects that do not "have a reasonably foreseeable significant effect on the quality of the human environment, or the significance of such effect is unknown."[29]

One notable example is the Kairos Hermes 2 Reactor's construction permit, where the NRC conducted an EA and issued a FONSI for the reactor's construction, which was located next to the reactor's test site. The NRC concluded, "On the basis of the EA, and its determination that the environmental impacts would be SMALL for each potentially affected resource area, the NRC staff has preliminarily determined that the proposed action would not have a significant effect on the quality of the human environment."[30]

The NRC's FONSI for Hermes 2 should be the rule, not the exception and become the agency's standard practice moving forward.

- **Eliminate the uncontested mandatory hearing requirement**

A provision not addressed in the ADVANCE Act is the uncontested mandatory hearing requirement for COLs. As required under the Atomic Energy Act, the NRC must conduct a public hearing with the agency's commissioners on every license reactor application before issuing a COL. While local community and public engagement is essential, these hearings occur after exhaustive outreach efforts have been conducted.[31] From pre-application activities to after the NRC's full review, the agency does a thorough job engaging with the public and local communities throughout the entire process. As Commissioner Annie Caputo noted, "The public has multiple avenues to participate in the licensing process, but the mandatory hearing is not one. A member of the public is not afforded the opportunity to speak, ask questions, or participate in the mandatory hearing, but may watch it and view the associated publicly available documents. Perhaps the most meaningful opportunity for the public to participate in the NRC's licensing process is the contested hearing process."[32]

Uncontested hearings are also costly. Recent uncontested mandatory hearings require as much as 1,500 hours of preparation by NRC staff and can cost millions of dollars—which is paid for by the license applicant.[33] In the case of Kairos Power's Hermes 2 reactor, which obtained its construction permit in December 2023, the mandatory hearing requirement added nearly 10% more NRC hours[34] to the process and delayed the reactor's approval by four months and half a million dollars.[35]

The NRC recently voted to reform the mandatory hearing process to consist of written statements, rather than oral hearing. However, the AEA still requires the NRC to conduct a form of public hearing before granting a COL. Both the House and Senate have introduced legislation to eliminate this requirement in the licensing process.[36]

- **Use NRC findings to pass policy reforms**

Much of the ADVANCE Act directs the NRC to conduct studies and report its findings to Congress. After the NRC reports these findings to Congress, it is up to lawmakers to respond with legislation that fixes the problem NRC identifies. Nor should Congress limit itself to the recommendations of the NRC. Many think tanks and nuclear energy analysts have identified policy and regulatory challenges to licensing and permitting new reactors.[37]

INTERNATIONAL COLLABORATION

Some of the global leaders in the nuclear power industry are America's strongest allies such as France, Japan, and South Korea. Until the ADVANCE Act, the AEA restricted the NRC from giving licenses to foreign companies or foreign governments. This has reduced competition and foreign investment in America's nuclear power industry and led to projects not moving forward. The ADVANCE Act relaxed this restriction by allowing manufacturers and developers from countries within the Organisation for Economic Co-operation and Development (OECD)[38] and the Republic of India, subject to NRC approval, to own and operate nuclear power plants in the United States. Not only will this provision open up competition, increase investment, and reduce costs, but it will also put nuclear power on an even playing field with other energy technologies like solar, wind, and natural gas—all of which can operate in the U.S. with foreign investment and ownership.

ADVANCE also seeks to increase America's exports of civilian nuclear technology. Under current law, the U.S. may only export reactor technology or nuclear fuel to countries that have signed 123 Agreements. These ensure strict nonproliferation standards between the U.S. and the receiving country.[39]

While nonproliferation is important, facilitating these agreements is time-consuming and has had the unintended consequence of pushing many developing countries to source their civilian nuclear materials from Russia or China (which do not require nonproliferation guarantees).[40] Under the ADVANCE Act, DOE will designate countries that haven't yet signed a 123 Agreement, many of which are American allies, as open for investment and cooperation. Doing so will allow American companies to engage with these countries without specific authorization from DOE.

In addition, Section 101 of the ADVANCE Act removes international exporting and innovation fees from the NRC's fee structure.[41] This will reduce upfront costs for American developers looking to export their technology, which will support American competitiveness and innovation abroad, establish better partnerships with allied countries, and incentivize more adoption of clean energy.

In addition to the recently enacted reforms, to encourage more international collaboration Congress should:

- **Adopt a robust, coherent strategy to export American technology**

  The U.S. strategy to increase nuclear energy exports is fragmented, inconsistent, and varies from administration to administration. "The process of exporting a nuclear reactor involves coordination among multiple entities, including Departments of State, Energy, Commerce, the Nuclear Regulatory Commission, EXIM, DFC, the U.S. Trade Representative, the National Security Council (NSC), and others," Niko McMurray, the Managing Director for International and Nuclear Policy at ClearPath, pointed out in recent testimony. "Ultimately, for U.S. companies to compete with the state-backed Chinese model, organized support across the federal government and the private sector is crucial."[42]

  The International Nuclear Energy Act, introduced by Senators Manchin (D-WV) and Risch (R-ID) and Representatives Donalds (R-FL) and Clyburn (D-SC), would help address this challenge by creating a federal working group to develop a 10-year nuclear energy export strategy and directing the Executive Branch to establish cooperative financing options for civilian nuclear exports with other nations.[43]

- **Export America's technical expertise in addition to its technology**

  Training and educational programs are essential to the success of exporting American nuclear energy technologies globally. While the delivery of a new American reactor may help a country reduce emissions and provide reliable, affordable energy to its consumers, knowledge transfers between American regulatory agencies and those in developing countries are arguably more important. As such, federal agencies should more actively engage with other nations to shore up respective regulatory bodies and increase technical expertise in these countries. While the NRC already engages in bilateral agreements, federal agencies should explore ways to increase scholarships and fellowships to make university engineering programs more affordable for international students.[44]

CONCLUSION

The ADVANCE Act takes several steps to modernize American nuclear energy and lower costs for the industry and, more importantly, for consumers. However, further reforms are needed to make nuclear power cost-competitive and more readily available to be deployed domestically and globally. Congress should use the momentum of the broad, bipartisan support that nuclear has to enact even bolder reforms that will capitalize on America's nuclear energy innovation, spur more investment, and deliver more affordable, reliable, and clean power.

ENDNOTES

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